The Science of
Chemicals

Science around us series, booklet - IV

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The Science of CHEMICALS

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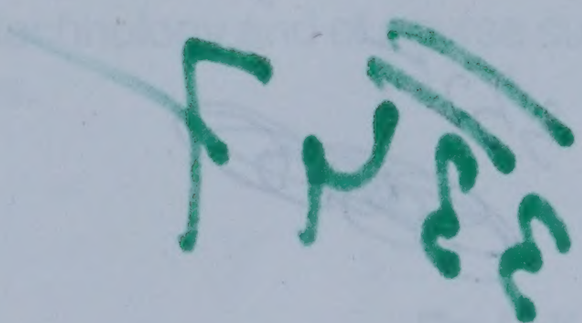

The Science of Chemicals

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Series Editor : **Anshuman Das**
Issue Adviser : **Joy Chatterjee**
Series Language Editor : **Malini Mukherjee**
Content Developer : **Sonia Guha**
Design : **Somjita Mukherjee**
Illustration : **Manab Pal**

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FOREWORD

The young mind is ever inquisitive, sometimes they ask questions which is difficult to find within the limitation of the text books. This series deal with such questions emerging out of the garden and kitchen and other places; describe the amazing achievements in the field of S&T communication; describes the alternatives to the danger of chemicals that we use daily.

National Council for Science and Technology Communication (NCSTC) is an apex body set up with the objectives of communicating science and technology, stimulating scientific temper and developing scientific capability amongst the people has collaborated with Development Research Communication and Services Centre (DRCSC), Kolkata, which is devoted to spreading and popularizing environment science amongst people for last 25 years to bring out this series to demystify scientific phenomenon of science in daily life for the children. Hope the grown up will enjoy it too.

We trust that this will encourage the children to search for larger picture, dig deep in to the mysteries of science & successes of technology and of course sustainable living alternatives.

Dr. D.K. Pandey
Scientist 'E'

Shreya heaved a sigh of relief as she gathered her stationary. The examination was over.

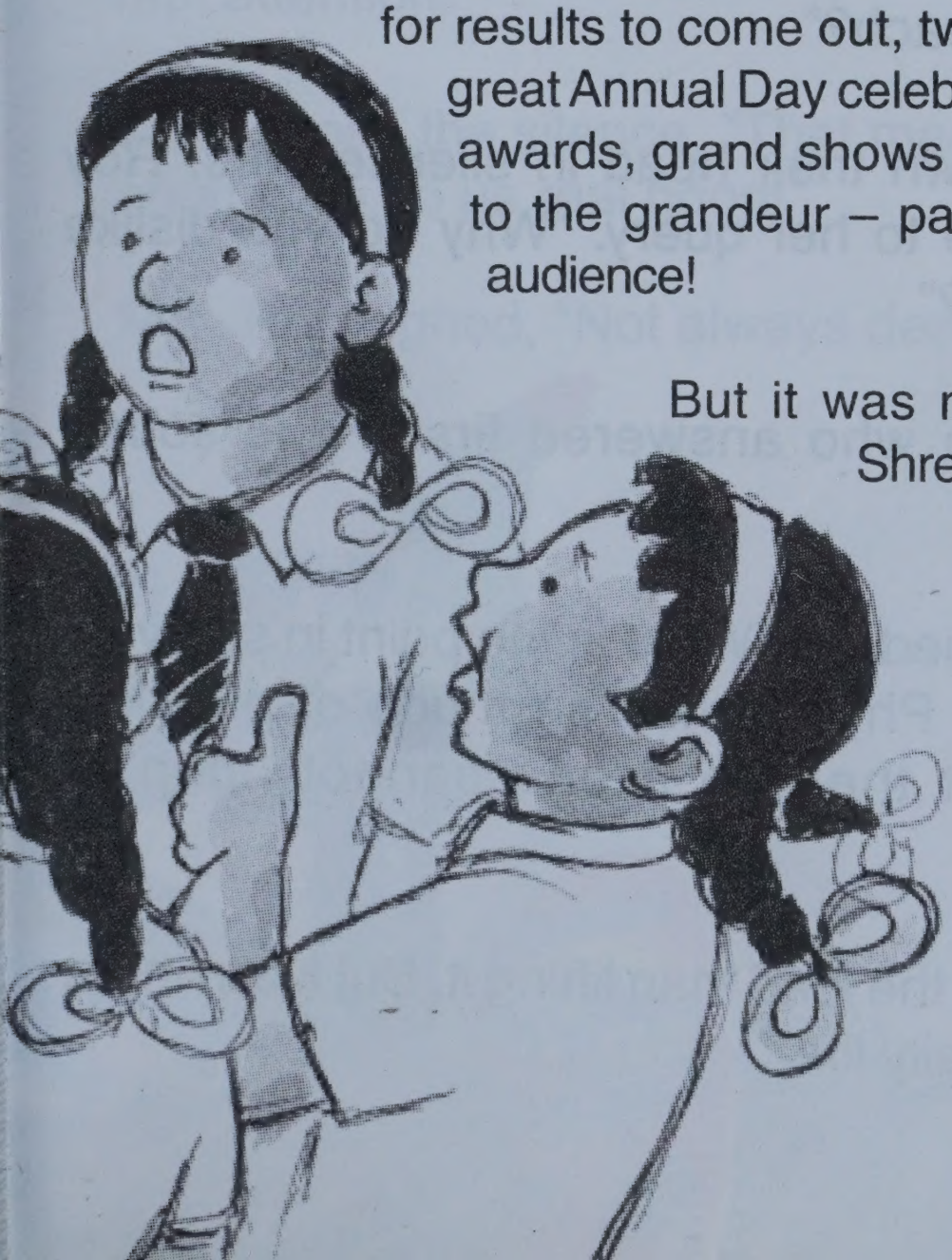
Julie walked up to her desk asking "So, how was the paper?"

Shreya made a face "It's CHEMISTRY! How do you expect it to be? "

Reva butted in to say, "I am glad it's over! "

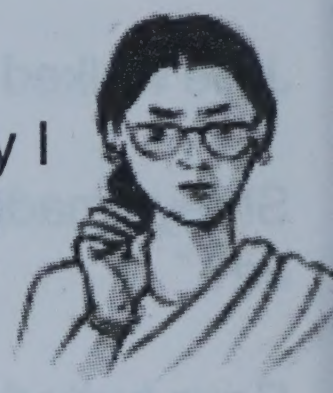
Julie smiled "We all are."

Together they went out to join others in the playground, rejoicing the end of the annual exams. Two more weeks were left for results to come out, two more weeks for the great Annual Day celebration-a time for yearly awards, grand shows by each class. To add to the grandeur – parents will be there as audience!



But it was not fun for Mrs. Roy, Shreya's class teacher, who also doubled up as their chemistry teacher. She had worried look on her face, as she glanced through the answer sheets of her class.

"Good morning Mrs. Roy"



"Good morning class, please sit down. Today I have something important to tell you. I had been going through your chemistry papers –"

There was a shriek from someone in the class.

"Behave yourselves!" and Mrs. Roy continued, "All I want to say is your papers show that you dislike chemistry. What is the problem? Is it because you find it difficult to understand what I teach?"

The class hung down their head in silence. Mrs. Roy added a softer note to her query. "Why do you dislike chemistry so much?"

It was Aasha who answered first, "It is soooo boring!"

Shreya carried on, "What is the point in studying Chemistry? Physics has so much of practical application – heat the cap if one cannot open it, or — "

Julie added, "sliding the load than lifting it. But Mam there is no chemistry in daily life."

Mrs. Roy smiled, "Everything in daily life is chemistry! You are chemistry; your body is chemistry. Right from the tip of your hair to your toe comprising of skin, bones, blood, hair, nails – everything is made up of chemicals. The food you eat – protein, fats carbohydrates are essentially chemicals. The air we breathe is 78 per cent nitrogen, 21 per cent oxygen and contains traces of other gases. We take chemicals in medicine when we are sick. Our daily soap, shampoo, toothpaste and other cosmetics are all made up of chemicals." She paused to look at the amazed faces. Never had they listened to their chemistry teacher with such rapt attention.

Molly broke the silence, "That means chemicals do us real good!"

Mrs. Roy sighed, "Not always dear."

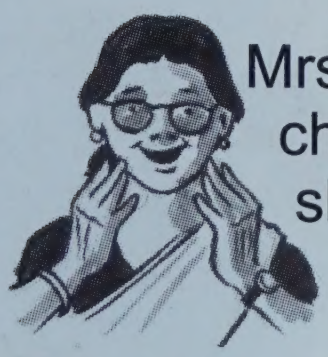
Reva said, "I remember my cousin once got rashes because she was allergic to certain chemicals in her cream."

Mrs. Roy agreed, "Unfortunately the use of chemical products have become such a common practice, we never stop to think whether their effect is harmful or not.More often than not, some products are really Harmful".

The effects of chemicals on health may range from temporary discomfort to permanent damage. The actual effect depends on the dose and toxicity of the chemical and the duration of exposure, in addition to personal factors.

Suddenly Shreya had an idea. She blurted out, "Mam can we put up an awareness programme On this topic for the Annual Day programme?"

Julie added, "That is a good idea!! No one ever thought of anything like it. We will be a major hit! Will you please help us Ma'am?"



Mrs. Roy was astounded, a class, which hated chemistry, now wants to put up a show on it! All she could say was, "I would love to."

"To start with", said Mrs. Roy, "you should first focus on the chemicals that our body directly comes in contact with. Girls, do you know that during normal breathing, we breathe in about 8.3 m^3 of air everyday! With the air we breath in, chemicals in the form of dust, mist, and gases enter our respiratory system."

We can be exposed to chemicals when:

- We breathe them
- Our skin comes in contact with them
- We swallow them

an eco friendly option

"What happens to these chemicals? Are they breathed out?" asked Reva.

"Depending on their constitution, gases and vapours may be absorbed in the blood," replied Mrs.Roy "for example a worker spraying paint without adequate protection may be heavily exposed to organic vapours by breathing."

The smaller the size of the particles we breathe, the more deeply they are likely to penetrate into the respiratory system.

Julie asked, "do all that we breathe in, harm us similar manner?"

Mrs. Roy replied, "Not necessarily."

Risk = toxicity x exposure time

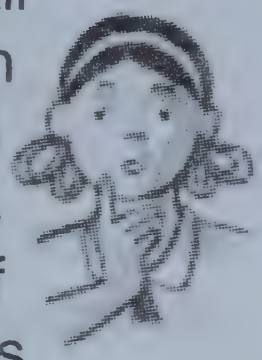
Risk due to chemical use depends both on the toxicity level and also on the frequency of the person's coming in contact with them. For a highly toxic chemical if there is no exposure, there is no risk. If there is ample exposure but the chemical is non-toxic, there is no risk

It was turn for Shreya to ask her question, "When do we breathe in these chemicals?"

Mrs. Roy had her own question, "When do we breathe, Shreya?"

"All the time, mam."

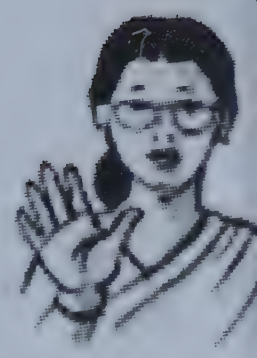
Mrs. Roy replied, "So chemicals enter and leave our bodies all the time. Tiny spores, pollen and bacteria by the thousands enter the lungs with each breath. Most of these are breathed out; others are removed or destroyed by the defence mechanisms of our body. While some chemicals announce their presence by their smell or sometimes colour, most often we breathe them without being aware of it. Our sense of smell is not always infallible. If we are suffering from flu or have been inhaling too much of a chemical, like perfume, for example, we may not be able to notice the presence of chemicals."



How deeply the aerosols (dust, mist, fog, smoke, or other kinds of particles suspended in air) penetrate the respiratory system, that depends upon the particle size, physical shape and properties of the chemical. Some particles are attacked by the body's defence cells, called macrophages, and may be either destroyed or converted into more harmful substances. The more the amount of chemicals we breathe and the longer we are exposed to them, the more serious are the health effects likely to be. Along with time the effect differs from person to person. Some individuals are more prone to the effects of chemicals than others. Similarly, children, the elderly, pregnant women and those weakened by illness are more at risk from the unhealthy effects of chemicals.

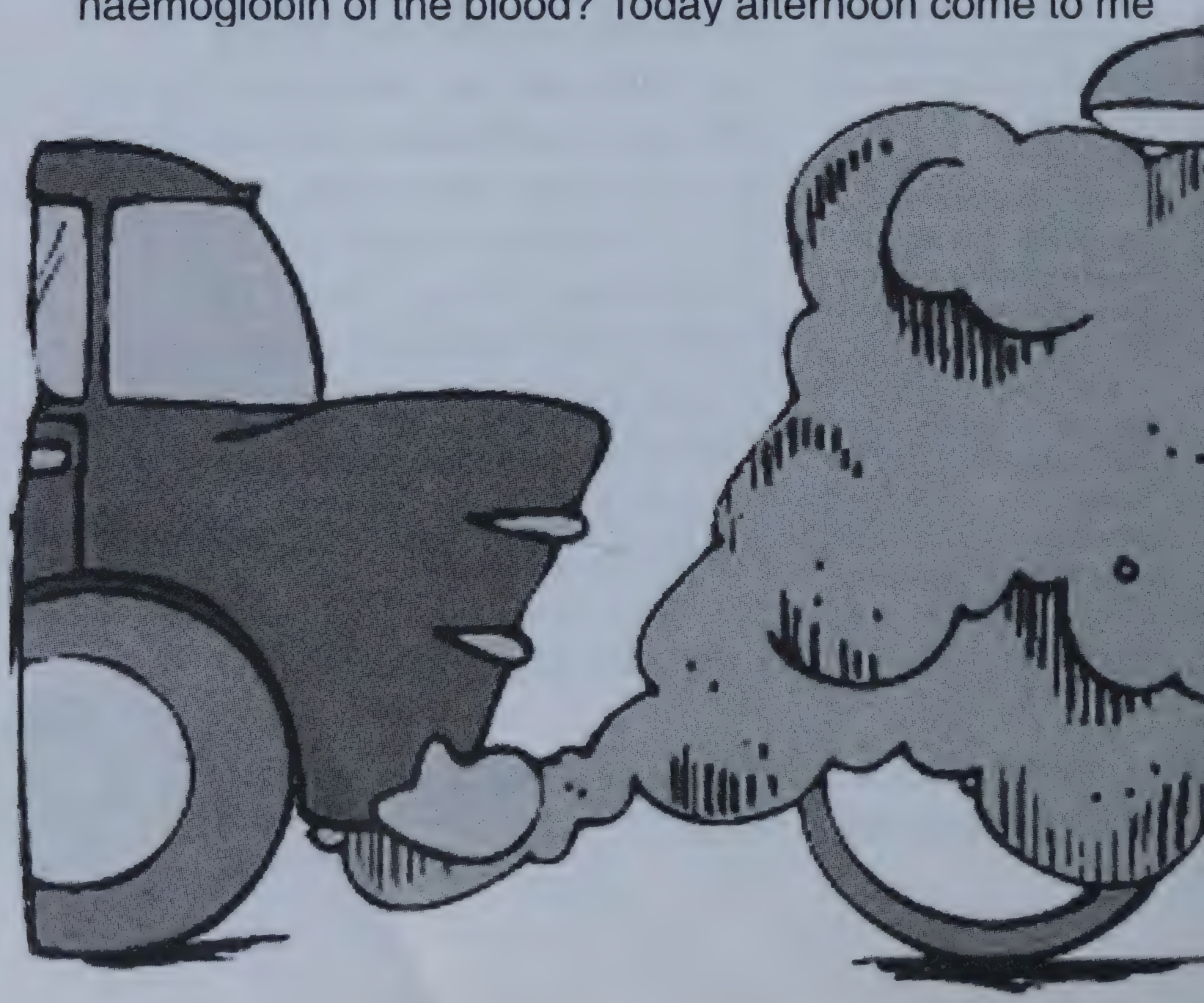
Rumela spoke up, "That means we can avoid chemicals by their smell?"

"Sadly, not always dear." Mrs. Roy continued,



"There are a large number of chemicals that have no smell. A deadly example is carbon monoxide gas. Every year hundreds of people die from breathing carbon monoxide when they sleep in a room with little or no source of air, heated by a burning fuel (wood, coal, oil or gas, etc.) Carbon monoxide is produced when a fuel burns where there is a lack of oxygen, and it has no smell.

I will give you a work. Go to the library and try finding out what is that compound that forms when oxygen, carbon dioxide and carbon monoxide form, when they react with haemoglobin of the blood? Today afternoon come to me



The class was called off. They thanked their teacher and dashed to the library, all excited and happy, at last, that they have a substantial topic for their show.

Do you know?

1. What chemicals can you breathe in at school?
2. Do you know anyone with an allergy? What causes it?
3. Have you read of any accidents where injury has occurred from exposure to chemicals? What were the chemicals and the way of entry into the body?
4. What is the name of the gas with a sharp odour which you can smell when you light a match?
5. What accidents have you known about involving carbon dioxide?

Chapter 3 The cleaning effect

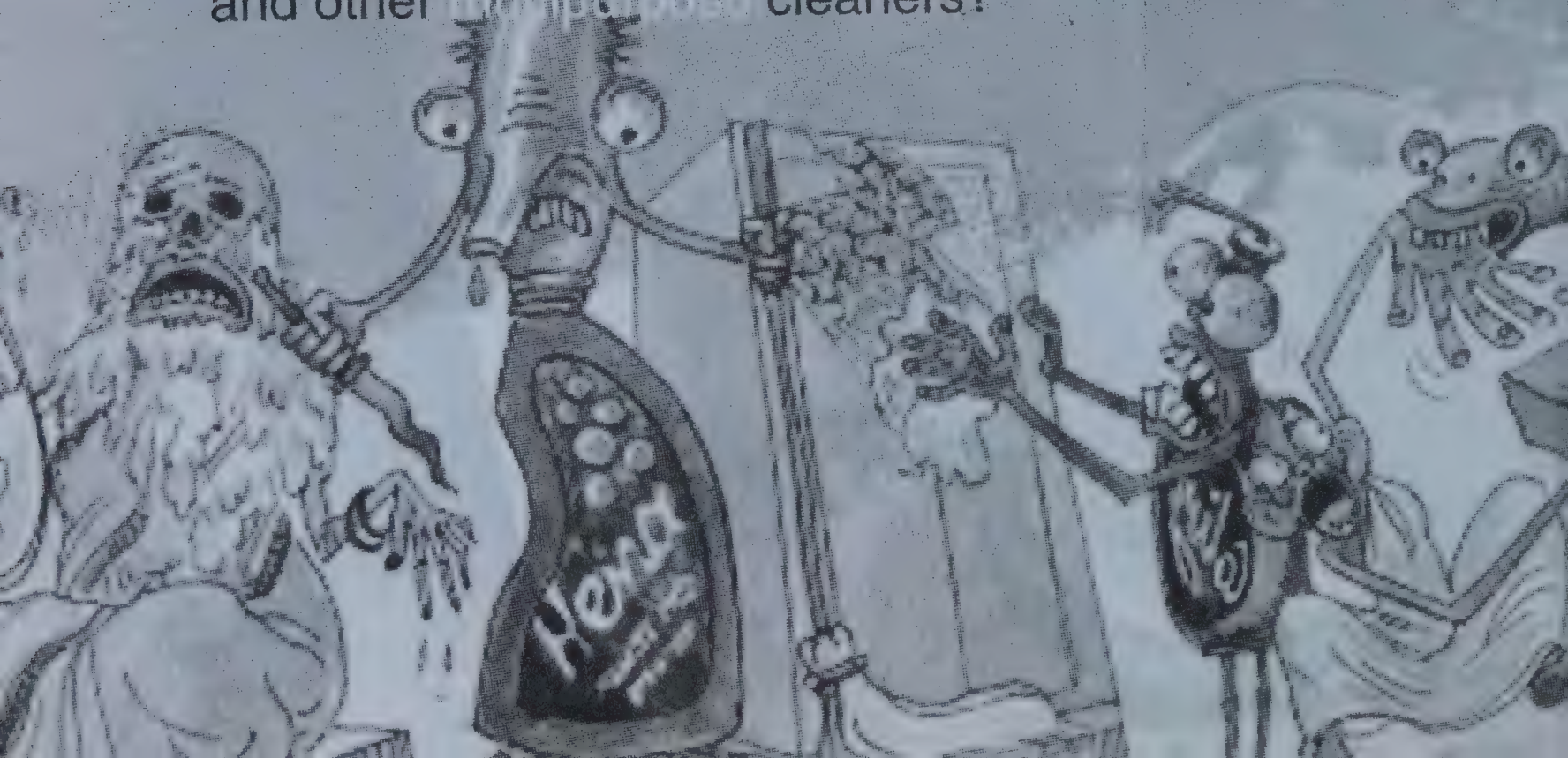
That afternoon an enthusiastic group awaited Mrs. Roy. They greeted her as she came in.

She smiled saying, "It's nice to see you all here-but where is Julie?"

Shreya replied, "She accidentally rubbed her eyes while using the stain remover her mother sent her. Her eyes have turned red; the burning sensation is not subsiding. Now she is with the matron."

Mrs. Roy replied with concern, "what a coincidence! Today I was planning to tell you about the harmful effects of household cleaners. You see, why we should avoid using these chemicals."

Aasha refuted, "But we need these cleaners for our hygiene. How can we possibly live without detergents, stain removers, dish wash, floor cleaners, toilet cleaners and other multipurpose cleaners?"



"Aasha, the actual fact is, commercial, name brand, chemical-based household cleansers have only been around for about fifty years. Despite the fact that these cleansers have only been around for such a short time, home cleaning had been in practice since long. So there are safer alternatives."

"If people managed fine without these chemicals then why were they made and put to use?" asked adamant Aasha.

She continued, "Have you ever used chemicals that are used for cleaning house? If you use these for long, your eyes will burn or your nose would get irritation. This is because these household cleansers contain hazardous toxins that are fatal to your nervous system, kidneys, liver, lungs and eyes.These cleansers, even when stored, can affect the air quality of your home."

Let us go through the actual history. Since the Second World War, more than 80,000 synthetic chemicals have been invented. Most have been created from petroleum and coal tar for the purposes of chemical warfare. The sad thing is that hardly any of these substances have been tested for safety, but have been added to our food, water and cleaning products without our consent and most often without informing us of any dangers.

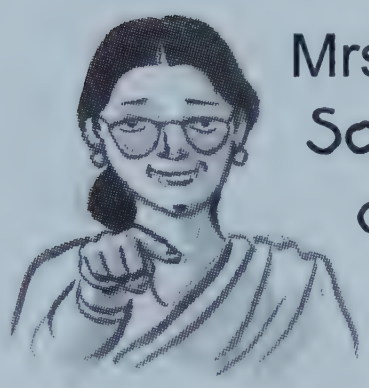
The first agent of this type was chlorine. The war ended with an abundance of this cheap chemical. In the name of huge profits, it was added to our water supply and many other products. Chlorine is the number one cause of breast cancer and can be lethal. Scientists' won't handle chlorine without protective gloves, facemasks, and ventilation, yet it is in most store-brand cleaners, including dishwasher detergents. The harmful effects are intensified when the fumes are heated, as in the shower. It's in our drinking water, swimming pools, Jacuzzis, and more.

Shreya whose mind was still on the Annual Day asked, "Please Ma'am, could you tell us the names of the toxins and the exact side effects they cause? We can put it up on the Slide Show we are preparing."

Mrs. Roy began, "Lets start with dish washers. They are marked "harmful if swallowed". But one should consider that residues remain and accumulate with each wash. The food evidently picks a part of this, more so if it is hot."

Rumela asked out of sudden realization "Ma'am, that means everything we use has some harmful constituents?"

Mrs. Roy replied, "Exactly so. Now we should try to be aware of such chemicals, try to figure out the possible natural substitutes or at least avoid the usage. I will give you a list of such chemicals."



Mrs. Roy continued, "Soap, vinegar, baking Soda, washing soda, ammonia, borax, alcohol, cornstarch, and certain food ingredients can be used to lift out spots and stains, deodorize, polish wood or metal, disinfect, scrub, repel pests, clean pets, wash and starch clothes, and to perform countless other household tasks."

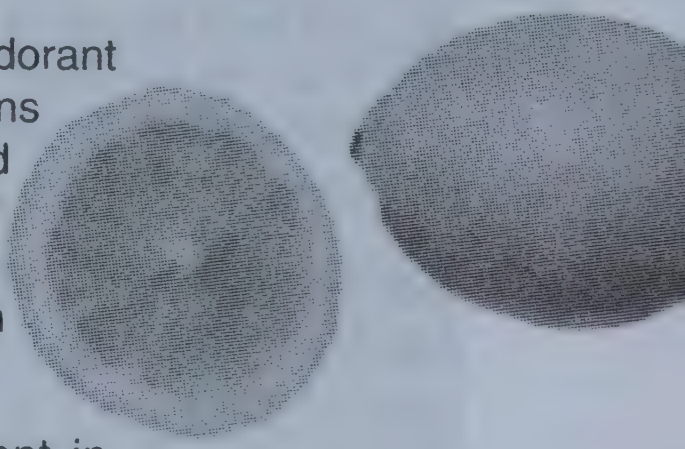
The alternatives

Baking Soda is sodium bicarbonate. It has a number of useful properties. It can neutralize acid, scrub shiny materials without scratching, deodorize, and extinguish grease fires. It can be used as a deodorizer in the refrigerator, on smelly carpets, on upholstery and on vinyl. It can help deodorize drains. It can clean and polish aluminum, chrome, jewelry, plastic, porcelain, silver, stainless steel, and tin. It also softens fabrics and removes certain stains. To remove burnt-on food, cover the burnt area with water, add two teaspoons of baking soda and bring to boil. Leave to cool and scrape off.

Borax is a naturally occurring mineral, soluble in water. It can deodorize, inhibit the growth of mildew and mold, boost the cleaning power of soap or detergent, remove stains, and can be used with attractants such as sugar to kill cockroaches.

Cornstarch, derived from corn, can be used to clean windows, polish furniture, shampoo carpets and rugs, and starch clothes.

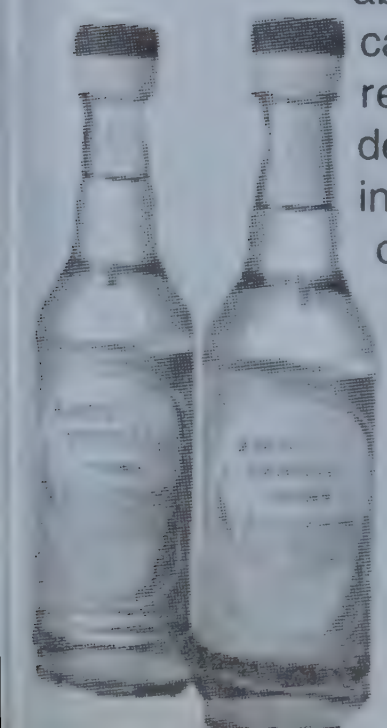
Lemon Juice, which contains citric acid, is a deodorant and can be used to clean glass and remove stains from aluminum, clothes, and porcelain. It is a mild lightener or bleach if used with sunlight. **silver and metal polish make** a paste with lemon juice and baking soda. Rub it on with a soft cloth, rinse with water, dry and polish.



Mineral Oil, derived from seeds, is an ingredient in several furniture polish and floor wax recipes.

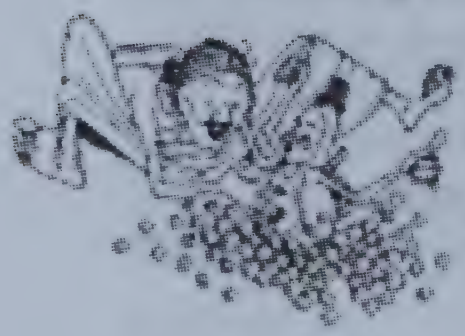
Steel Wool is an abrasive strong enough to remove rust and stubborn food residues and to scour barbeque grills.

Vinegar is made from soured applied juice, grain, or wine. It contains about 5 percent acetic acid, which makes it a mild acid. Vinegar can dissolve mineral deposits, grease, remove traces of soap, remove mildew or wax buildup, polish some metals, and deodorize. Vinegar can clean brick or stone, and is an ingredient in some natural carpet cleaning recipes. Use vinegar to clean out the metallic taste in coffeepots and to shine windows without streaking. Vinegar is normally used in a solution with water, but it can be used straight. Use pure soap to wash dishes and add white vinegar to the rinse water to give glasses an extra shine.



Do it yourself

A. Making wood ash lye water, a natural liquid detergent



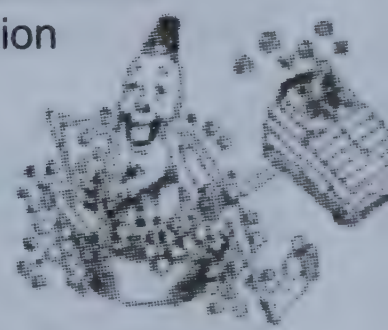
What do you need ?

Ash from burning natural and untreated wood. Wood which has not been painted, stained, or chemically treated in any way what so ever.

What to do ?

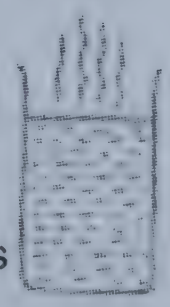
- The gray ash is first sieved to remove any pieces of charcoal.

- The sieved ash is added to approx. 4 to 5 parts of hot or cold water. The mixture is stirred for a few minutes then left for 12 to 24 hours. After this period, the ash will settle to the bottom of the container to form a gray sediment. A clear solution will form on top of the ash sediment.
- Pour off the clear solution, which is your wood ash lye water. Lye water has a slippery feel similar to soapy water.



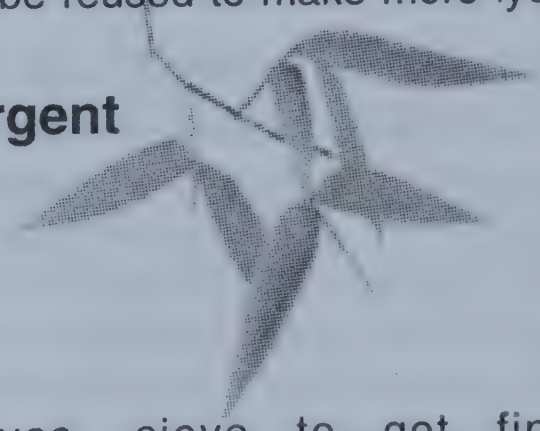
How to use ?

Ash lye needs to be diluted with hot water for use, similar to any liquid detergent. A stronger lye may be prepared by bringing 1 : 3 [ash to water by volume] to a boil and then letting it sit for 12 to 24 hours before pouring off the clear solution of lye water.



The spent ash that remains in the container, contains high amounts of potash alkali, which can be reused to make more lye water.

B. Bamboo leaf detergent

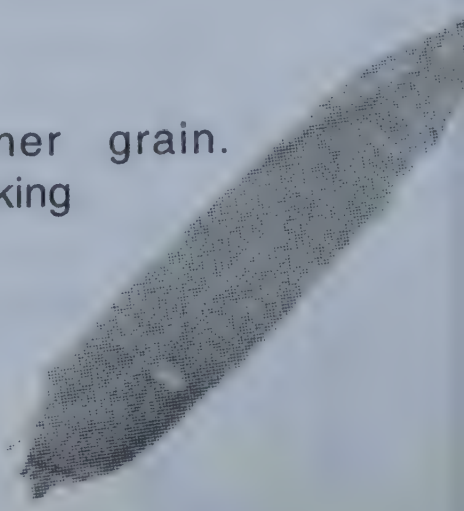


What you need ?

Dry bamboo leaves.

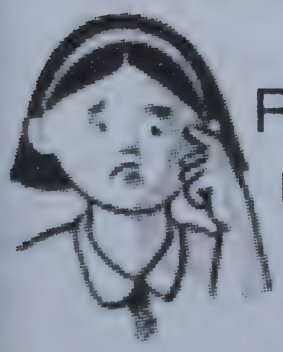
What to do ?

- Burn bamboo leaves, sieve to get finer grain.
- Mix it with baking powder in a ratio 95:5 (ash : baking powder). Your dishwashing detergent is ready.



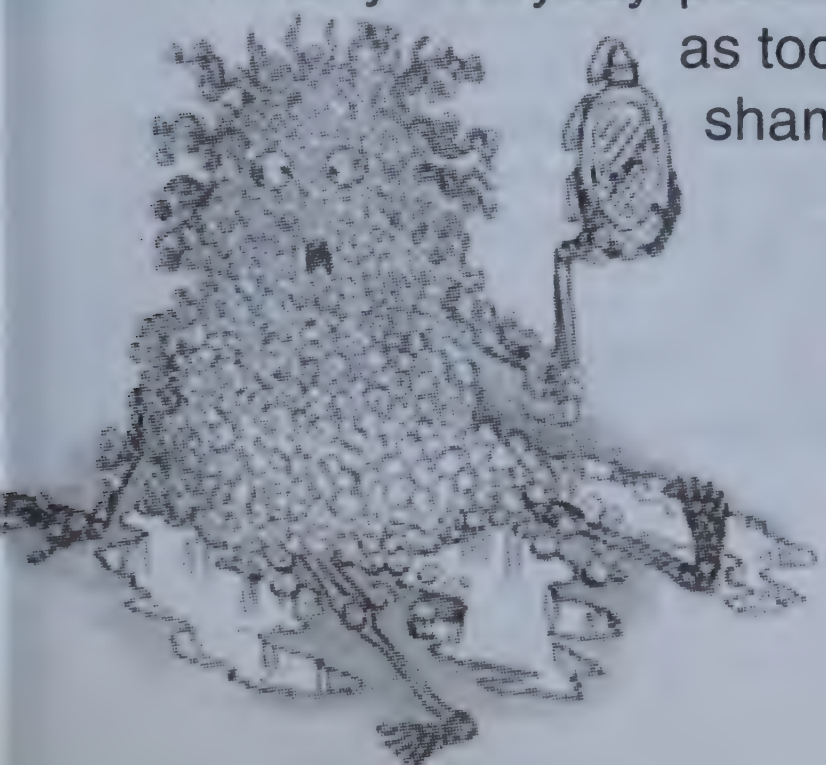
Chapter 4 The repellants

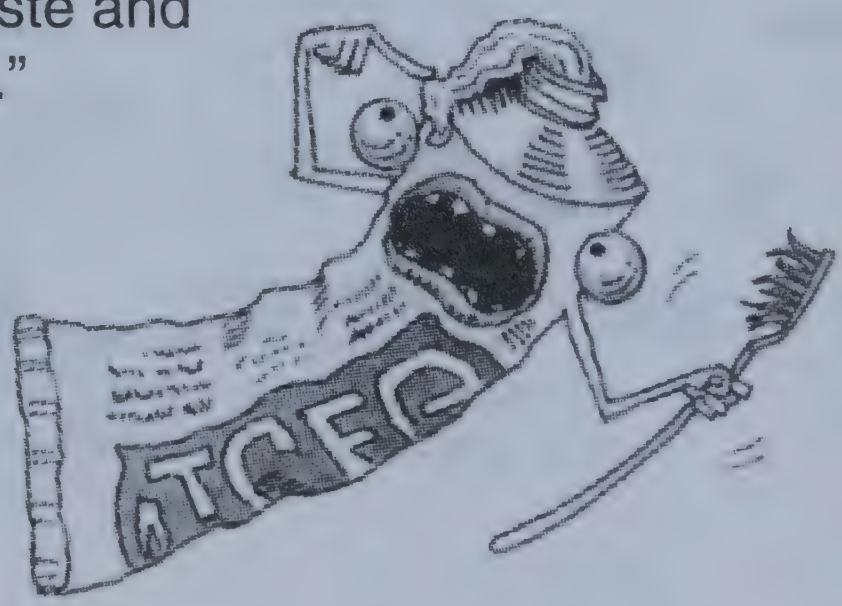
Next day the class meets again for more information from Mrs. Roy, but there is an air of gloom, which she senses as soon as she enters. Enquiring on the matter she learns that Adrija could not come to school as her little brother took to bed after accidentally swallowing some insecticide which kills rats.

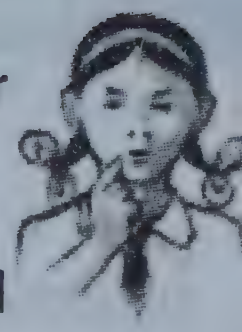


Rumela asked in fear, "Ma'am do the pest repellents harm us too?"

"Let's look at it logically,", Mrs. Roy replied, "an insect dies when it comes in contact with a certain chemical. We are made up of cells just as the insect; maybe the number is many times greater, therefore with a certain amount of toxic chemicals the effect subsides with increasing number of cells. So you see in a single dose it may not be fatal but it is harmful. As we are exposed to a range of such products over the years, it will have some adverse effect in the long run. In short, pesticides are dangerous. You may be surprised to find out just how many everyday products contain pesticides, such as toothpaste and shampoo."







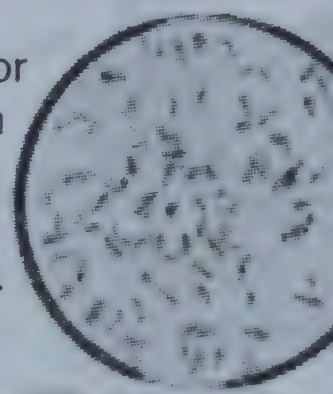
"What are the effects? Can't we use some other alternatives?" asked Shreya.

"In her last letter, mother said our house is infested with ants, what can we do about it?" asked Julie.

Mrs. Roy replied, "Not so fast, I have brought a list of possible alternative pest control methods."

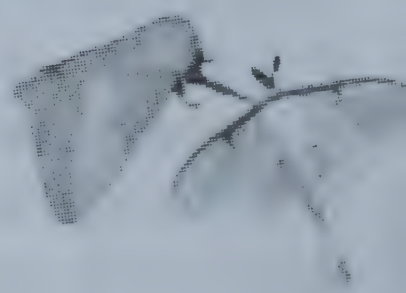
Ants
Sprinkle chilli powder, pepper, mint or borax in their trail.

Fleas
Vacuum clean regularly and sprinkle lavender or pennyroyal around infested rooms. Empty vacuum cleaner after each use. Add brewers yeast to your pet's diet, and flea comb them regularly. Feed pet brewer's yeast in powder form mixed with food or by tablets.



Nits
Shampoo regularly with tea tree oil shampoo.

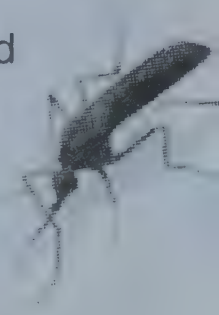
Moths
Clean all clothes, bedding and furnishing fabrics before storing because moths breed in dust and dirt. Store in plastic Air clothes well in the sun; store in airtight containers, and scatter sachets of lavender, cedar chips, or dried tobacco in with clothing.



Insect repellant
Rub vinegar or tea tree oil on exposed areas of skin.

Flies
Keep all food and rubbish covered and clean the rubbish bin regularly. Simmer vinegar on the stove while leaving the windows open. Keep basil plants around the house.

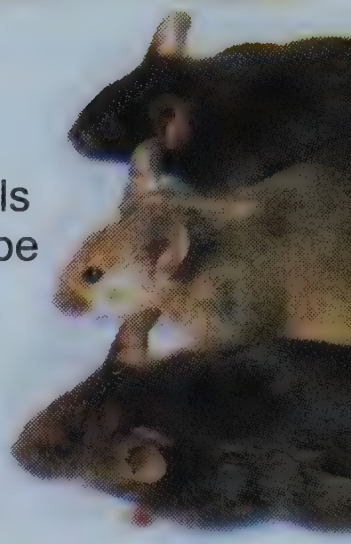
Mosquitos
Use citronella oil or candles, plant basil or pennyroyal and eliminate all stagnant water around the house. Use smoke made from dried orange peel or raisin.



Beetles: Kill manually when you see them.

Cockroaches: Mix by stirring and sifting 30 gm TSP, 180 gm borax, 120 gm sugar, and 240gm flour. Spread on floor of infested area. Repeat after 4 days and again after 2 weeks.

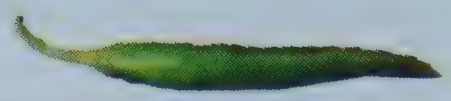
Rats and mice:
Again, prevention may be the best cure. Holes in exterior or interior walls should be closed off and storage spaces kept orderly. Garbage should be kept tightly covered. To catch rodents, the most efficient system is the oldest: a cat. Next best are mouse and rat traps.



Termites: Any wooden parts of the house should be at least 18 inches off the ground, as subterranean termites cannot tolerate being exposed to air and light. They have to build easily visible mud tunnels to get at available wood. However, most existing houses have only about an 8-inch clearance between wooden parts and the ground, which makes the wood vulnerable. Metal shields may help discourage termites, but they cannot prevent infestations.

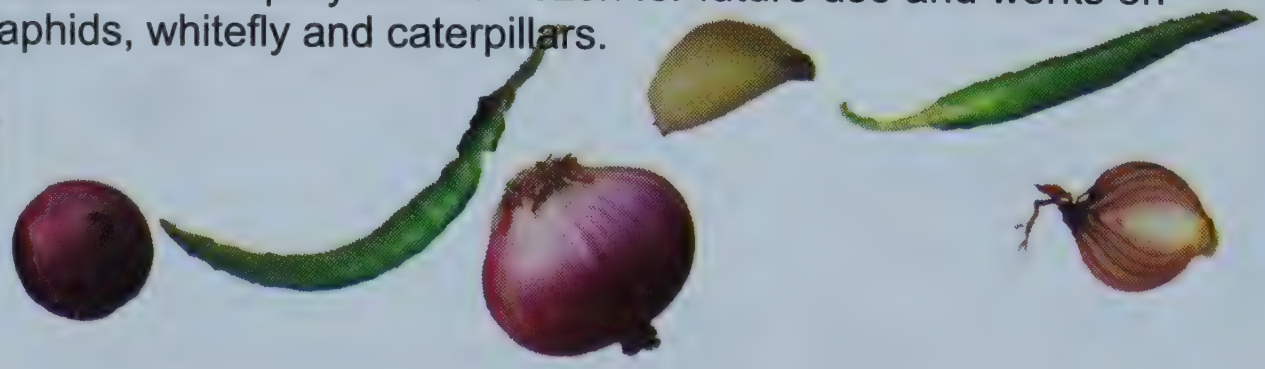
Snails
Try setting up physical barriers such as broken eggshells, or handpicking them at night. A shallow pan of beer also attracts snails.

Do it yourself : Alternative Recipes

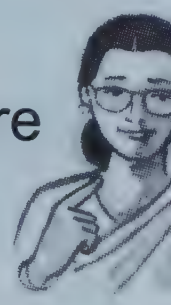


Garlic spray

Blend 2 or 3 very hot chilli peppers, half an onion and one clove of garlic in 4 litres of water. Boil and leave to soak for 2 days. Strain and use. This spray can be frozen for future use and works on aphids, whitefly and caterpillars.

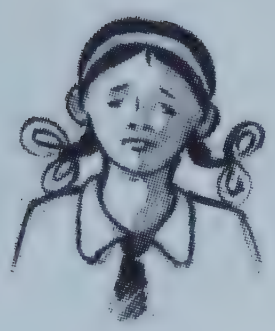


Chapter 5 Fare and Ugly !!



"Can anyone in the class tell me another field where we use maximum chemicals?"
There was no response.

"Come on, try, don't be silent.", said the teacher to the class.



"Cosmetics?" whispered the timid Gunja.

"Yes, you are correct. As growing girls, you will find the media tempting you with alluring products that promises to transform you into the next Ms. World. I want to brief you up on the chemicals used in the cosmetics. Remember, even the herbal products contain chemicals!"

The dangerous beauty chemicals

Diethenolamine (DEA)
It's cheap ... It makes lots of bubbles

Industrial Use	Personal Care Product
1. Laundry Detergents	1. Shampoos
	2. Body Gels
2. Dishwashing Liquid	3. Hair Dyes
	4. Facial Cleansers & Lotions
	5. Baby Shampoos & Bubble Baths

DEA is readily absorbed through the skin and accumulates in organs, such as the brain, where it induces chronic toxic effects. Lifelong use of these products thus clearly poses cancer risks.

Sodium Laurel Sulfate (SLS)

It's cheap...It foams a lot...It thickens with salt.

Industrial Use	Personal Care Product
1. Harsh Floor Cleaners	1. Toothpaste
2. Engine Degreasers	2. Shampoos
3. Car Wash Detergents	3. Body Gels
4. Laundry Detergents	4. Bubble Baths
	5. Facial Cleansers
	6. Baby Wipes
	7. Baby Shampoos & Bubble Baths

SLS can damage the immune system; causing separation of skin layers and inflammation of skin. SLS penetrates into the skin and into the eyes, and is also held in the brain, heart and liver. SLS denatures proteins of eye tissues - impairing eye development permanently.

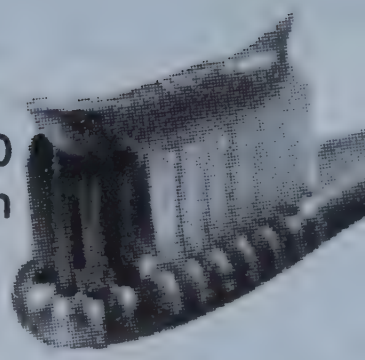
Propylene Glycol

Industrial Use	Personal Care Product
1. Anti-Freeze	1. Shampoos
2. Brake and Hydraulic Fluid	2. Hair Conditioners
3. Paint	3. Hand and Body Lotions
4. Floor Wax	4. Skin and Beauty Creams
	5. Deodorants

Propylene Glycol causes significant number of reactions and is a primary irritant to the skin in low levels of concentrations. Implicated in contact dermatitis, kidney damage and liver abnormalities.

Fluoride

Fluoride is used in toothpaste. Fluoride is linked to 10,000 cancer deaths yearly. Flouridation is also responsible for 40 million cases of arthritis, dental deformity in 8 million children and allergic reactions in 2 million people.



Talc

Talc is a very fine substance, so fine it can be used as a "dry" lubricant. Talc is a chemical similar to asbestos, a known cancer causing substance. Talc is found in many "baby and body" powders, feminine powders and many cosmetics. While it makes your skin "feel" slippery smooth, talc does so much more. Talc cloggs the pores that secrete those necessary fluids. Also, those fine little particles manage to get into the system. And being similar to asbestos is not comforting, especially when used on babies and genital areas.

"Oh! my god" - a collective voice blows out from the girls.

"But, there are no other option, we have to use those cosmetics" - Shreya said.

'Yes, if not for beautification, but for comfort" - Julie echoed.

"Is it so girls? How did the ancient queens and princess used to make up? Haven't you read Sanskrit plays?" - Mrs. Ray pointed out.

... and a few alternatives

BATH TIME

Vinegar Bath

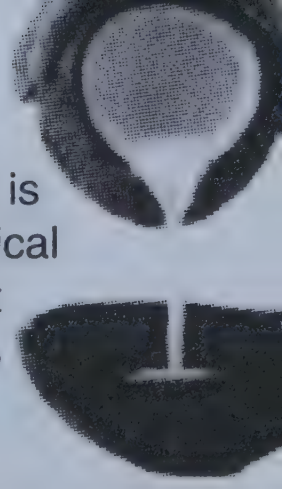
For itchy dry skin add a cup of vinegar to the bath water.

Basil Bath

Put some dried basil in a muslin bag and tie to bath tap or put in bathwater for a stimulating and invigorating bath.

Oil Bath

Did you know using just a few drops of essential oils in your bath is a cheap non-chemical alternative to bubble baths that is chemical free and won't dry out your skin? As an added bonus, different oils have different properties to match your mood – lavender is calming and relaxing, lemon stimulating and invigorating.



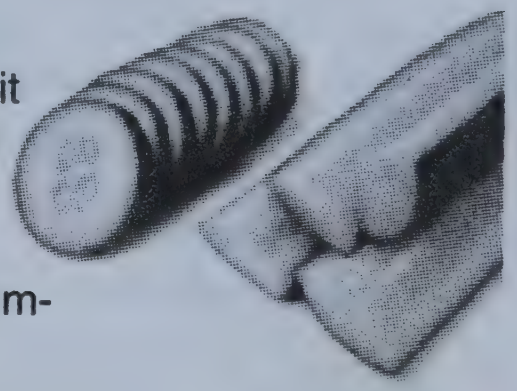
SKIN CARE

Steam Cleanser

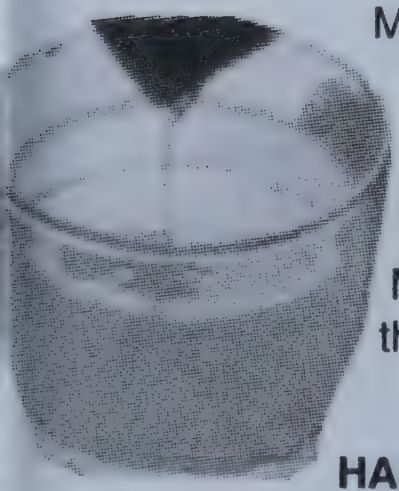
Steaming is the most thorough, deep-cleansing method of cleansing your skin and is beneficial to all skin types. Once a week normally, less often if skin very dry, daily if very greasy.

Lean over a bowl of boiling water, cover your head with a towel and make a tent around the bowl. Stay one to two feet away from the water surface and add herbs or essential oil to the water for even more benefit. Use lavender, mint, thyme and rosemary for a stimulating cleanse.

Cucumber skin tonic



Cut half a cucumber into chunks and liquidize. Strain it and you have a fresh and cool cucumber lotion. Use as soon as possible as it goes off quickly.



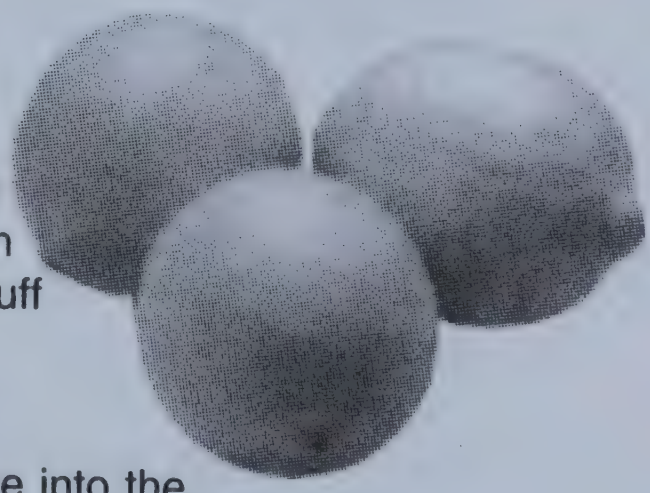
Mash and sieve or liquidize ¼ of a cucumber and add two TBS of yoghurt.

Lemon Juice

Rub lemon juice on the skin to banish blackheads and acne. Mix lemon juice with salt and use to rub off dead skins cells on the knees and elbows.

HAIR CARE

Lemon/Vinegar Hair Rinse

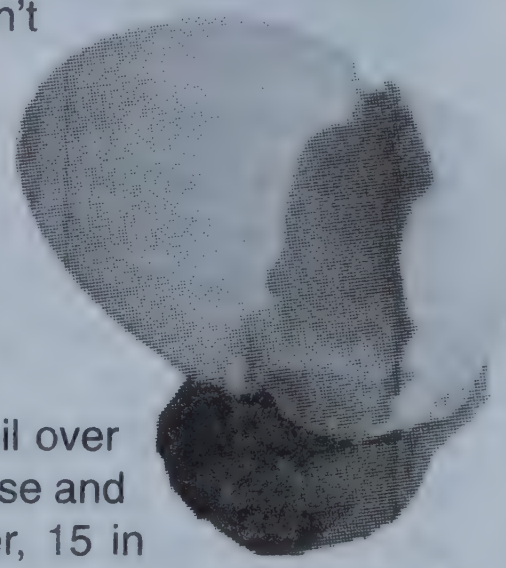


Use diluted lemon juice/vinegar in your final rinse when washing hair to increase shine. (1 part lemon juice/vinegar to 8 parts water), it is good for dandruff also.

Dry Hair Conditioner

For dry, damaged hair heat some oil and massage into the scalp. Wrap your head in a warm towel and leave for half an hour. Wash off with a home made shampoo. Coconut, olive and castor oil can all be used.

Egg Shampoo
This is a very old recipe. Beat one or two eggs in a cup of water and massage into wet hair for five to ten minutes. It is important to allow time for the egg to clean the hair and the protein in it to act as a conditioner. It is important to rinse off thoroughly. Don't use hot water as this will scramble the egg!



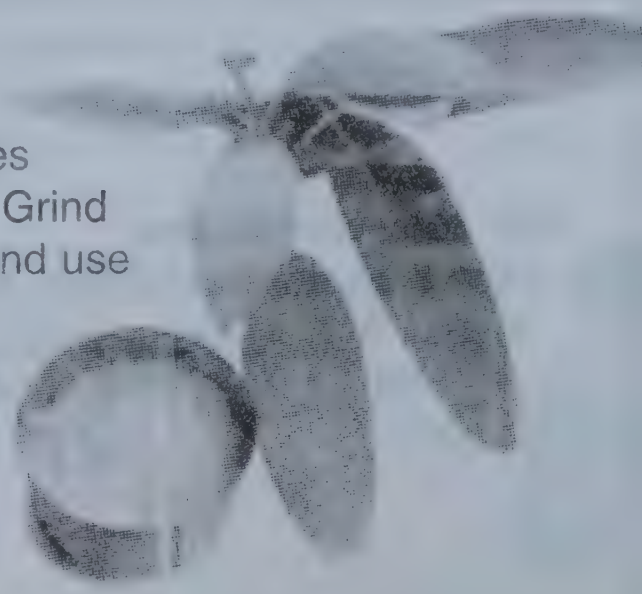
LIPS
Lip Balm
2-4 TBS of rose or marigold petals
1 Cup almond oil

Fill a sterilised jar with petals and slowly pour the oil over them. Fill to within one inch of the top of the jar. Close and label and leave in the sun for five days in summer, 15 in winter. Strain oil off during warm part of the day. Press the petals to extract all the oil. Warm this oil in a double boiler, stirring continuously. Add 1 TBS of beeswax. Add 1 tsp honey, 1 tsp vanilla extract, tea spoon of vitamin e oil, and 1 tsp aloe vera gel. Close tightly. The balm will harden quickly. Apply it as needed.

DEODERANT
Herb Deodorant
Grind: ½ tsp cloves
1 tsp myrrh
1 TBS coriander seeds
1 tsp cassia
2 TBS lavender flowers
1 tsp thyme
with a pestle and mortar. Use under arms as a deodorant. Some skins are sensitive to dried herbs so test a little first.

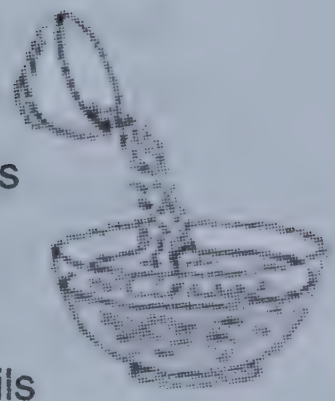
Sage Tooth Powder
A couple of handfuls of sage leaves
1 handful of sea salt

With a pestle and mortar grind the sage leaves into the sea salt. Bake in the oven until hard. Grind again into a fine powder. Put in a sealed jar and use instead of toothpaste.



Do it yourself

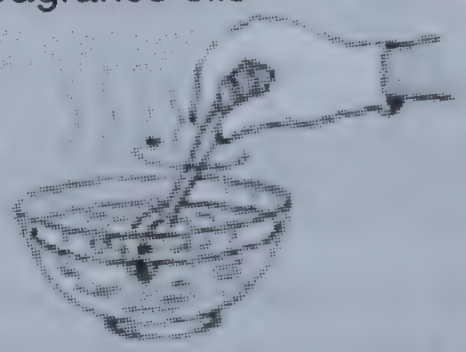
Make your own home made soap
You need: lye, water, coconut oil, olive oil



Steps:

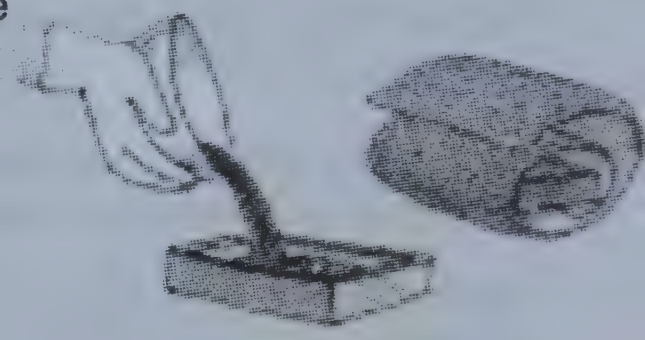
1. Dissolve 360 ml lye in 1 litre softened water in a plastic or glass bowl. Pour the lye slowly and in a steady stream, and stir constantly with a plastic spoon. Set the mixture aside to cool.

2. Mix 720 ml coconut oil and 725 ml olive oil and any fragrance oils you want to use.



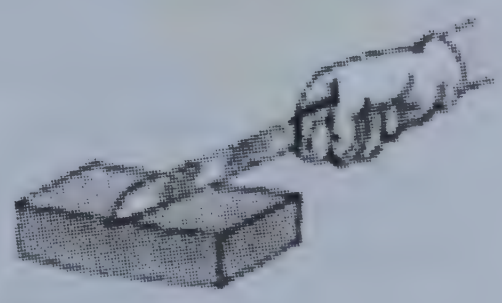
3. When the lye mixture is cooled to room temperature, slowly combine the two mixtures, adding the lye to the oils. Stir slowly and constantly. If you see bubbles, stir more slowly.

4. Pour the mixture into the mould. Wrap the mould in a towel and leave it undisturbed for 18 hours. The soap mixture will heat up and then cool down. Avoid uncovering it until it's cooled. Allow the soap to sit in the uncovered mould for another 12 hours.



5. Cut the soap into bars with a knife.

6. Use it after 3-4 weeks.



Tips
Hard water is difficult to work with. Use distilled water.

Lye is wickedly caustic. Always wear eye protection and gloves when using it. Keep a cup or two of vinegar handy in case you get lye on your skin.

(See http://www.ehow.com, http://www.make-stuff.com for more)

"I hope class that I have provided you with enough information. Now start working on it. Think and figure out the details of presentation. I will give you some holiday homework before you leave today."

There are a number of "Oh'no!!"s from the class. Mrs. Roy has a gleam in her eye, "Don't grumble, first check what the work is."

Homework

Make Your Own Spray 'n' Wipe
Ingredients: borax powder, baking soda

Mix 1/4 cup of borax powder with 1/4 cup baking soda. Add just enough water to make a paste. Use this for cleaning general kitchen surfaces, or add less water for scouring.

Make Your Own Window Cleaner
Ingredients: vinegar, newspaper, spray bottle

In a spray bottle, mix 2 tablespoons of vinegar and one litre of water. Spray on your windows and use the newspaper to clean.

Make Your Own Kitchen Floor Cleaner
Ingredients: white vinegar, baking soda, borax powder

Mix together baking soda and a bit of borax powder and add to your mop water. The borax will keep away many insects (except ants). The white vinegar can be used for rinsing, to add a natural shine and keep away ants.

Make Your Own Disinfectant
Ingredients: citricidal or tea tree oil, water

Add 20 drops of citricidal or up to 50 drops of tea tree oil to a bucket of water. Stir well. Use this for wiping floors, counters, sinks, bathroom tiles, shower stalls, and toilet seats. If you would like to discourage mold from growing in your showers stalls, add 5 drop of citricidal to a spray bottle filled with water and spray on your tiles.

Note: Citricidal and tea tree oil can be found at your local health food store. Borax powder can be found in some drug stores, grocery stores, or craft stores. (Please be careful; citricidal, tea tree oil, and borax powder should not be ingested by adults, children or pets. Not that you would, but just in case.)

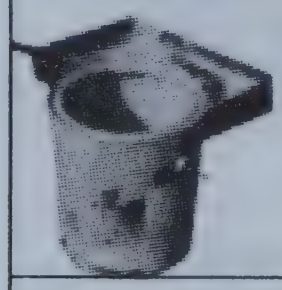
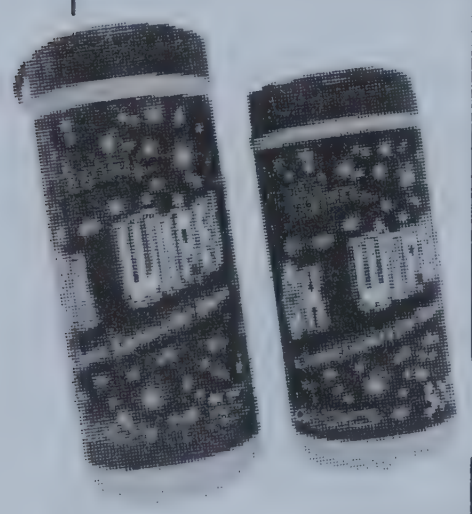
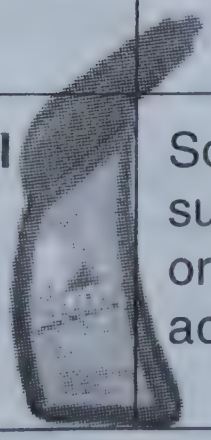
Checklist

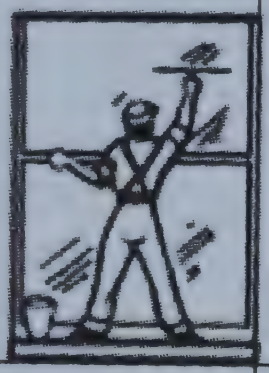
HOUSEHOLD PRODUCTS AND THEIR HAZARDOUS INGREDIENTS

Product type	Possible ingredients	Potential hazards
Air Freshener and Deodorizer	Formaldehyde	Toxic; carcinogen; irritant to eyes, nose, throat, and skin; may cause nausea, head aches, dizziness, nosebleeding, memory loss, & shortness of breath.
Bleach	Sodium hypochlorite	Corrosive, irritates or burns skin, eyes, respiratory tract; may cause pulmonary edema or vomiting and coma if ingested; contact with other chemicals may cause chlorine fumes.
Disinfectant	Sodium hypochlorite	Corrosive; irritates or burns skin, eyes; may cause pulmonary edema or vomiting and coma if ingested.
	Phenols	Flammable; very toxic; respiratory, circulatory, or cardiac damage.
	Ammonia	Vapour irritating to eyes, respiratory tract, and skin; possible chronic irritation.

Product type	Possible ingredients	Potential hazards
Drain Cleaner	Sodium or potassium Hydroxide (lye)	Caustic; irritant; inhibits reflexes; burns skin, eyes; poisonous if swallowed owing to severe tissue damage.
	Hydrochloric acid	Corrosive; irritant; damage to kidney, liver, and digestive system.
	Trichloroethane	Irritant to nose and eyes; central nervous system depression; liver and kidney damage if ingested.
Flea Powder	Carbaryl	Very toxic; interferes with human nervous system; may cause skin, respiratory system, cardiovascular system damage.
	Dichlorophene	Skin irritation; may damage liver, kidney, spleen, and central nervous system.
	Chlordane and other chlorinated hydrocarbons	accumulates in food chain; may damage liver, kidneys, and skin.
Floor Cleaner Wax	Diethyleneglycol	Toxic; causes central nervous system depression and kidney, liver lesions.
	Petroleum Solvents	Highly flammable; associated with skin and lung cancer; irritant to skin, eyes, nose, throat, lungs.

Product type	Possible ingredients	Potential hazards
	Ammonia	Vapour causes irritation to eyes, respiratory tract, and skin; possible chronic irritation.
Furniture Polish	Petroleum	distillates or mineral spirits highly flammable; moderately toxic; associated with skin and lung cancer; irritant to skin, eyes, nose, throat, lungs; entry into lungs may cause pulmonary edema.
Oven Cleaner	Sodium or potassium hydroxide (lye)	Caustic; irritant; inhibits reflexes; burns skin, eyes; poisonous if swallowed, causing to severe tissue damage.
Paint Thinner	Chlorinated aliphatic hydrocarbons	Slow decomposition; liver and kidney damage.
	Esters	Toxicity varies from chemical to chemical; causes eye, nose, and throat irritation and anesthesia.
	Alcohols	Volatile and flammable; eye, nose, and throat irritation.
	Chlorinated aromatic	Flammable; toxic; accumulates in food chain.
	Hydrocarbons	Flammable; toxicity varies from chemical to chemical;

Product type	Possible ingredients	Potential hazards
		may cause respiratory ailments.
Paint 	Aromatic hydrocarbon thinners	Flammable; skin irritant; benzene is a carcinogen; possible liver and kidney damage.
	Mineral spirits	Highly flammable; skin, eye, nose, throat, lung irritant; very high air concentrations may cause unconsciousness, death.
Spot Remover 	Perchlorethylene or trichloroethane	Slow decomposition; liver and kidney damage; perchlorethylene is suspected carcinogen.
	Ammonium hydroxide	Corrosive; vapour extremely irritable to skin, eyes, and respiratory passages; ingestion causes tissue burns.
	Sodium hypochlorite	Corrosive; irritates skin, eyes, respiratory tract; may cause pulmonary edema and skin burns.
Toilet Bowl Cleaner 	Sodium acid sulfate or oxalate or hypochloric acid	Corrosive; burns skin contact or inhalation; ingestion may be fatal.

Product type	Possible ingredients	Potential hazards
	Chlorinated phenols	Flammable; very toxic; respiratory, circulatory, or cardiac damage.
Window Cleaner 	Diethylene glycol	Toxic; causes central nervous system depression and degenerative lesions in liver and kidneys.
	Ammonia	Vapour irritating to eyes, respiratory tract, and skin; possible chronic irritation.
Wood Stain/ Varnish	Mineral spirits, gasoline	Highly flammable; associated with skin and lung cancer; irritant to skin, eyes, nose, throat, lungs; entry into lungs may cause fatal pulmonary edema.
	Methyl and ethyl alcohol	Flammable; damage to eyes, skin, central nervous system.
	Benzene	Flammable; carcinogen; accumulates in fat, bone marrow, liver tissues.
	Lead	Damage to digestive, genitourinary, neuro-muscular and central nervous system; anemia and brain damage.

Product type	Possible ingredients	Potential hazards
Antifreeze	Ethylene glycol	Very toxic, 3 ounces can be fatal to adult; damage to car cardiovascular system, blood, skin, and kidneys.
	Methanol	Moderately toxic; respiratory damage.
Car Wax, Polish	Petroleum	Associated with and lung distillates cancer; irritant to skin, eyes, nose, lungs; entry into lungs may cause fatal pulmonary edema.
Motor Oil / Gasoline	Petroleum hydrocarbons (benzene)	Highly flammable; associated with skin and lung cancer; irritant to skin, eyes, nose, throat, lungs; pulmonary edema; benzene is a carcinogen.
	Lead	Damage to digestive, genitourinary, neuro-muscular, and central nervous system; anemia and brain damage.

To remove stain, try this

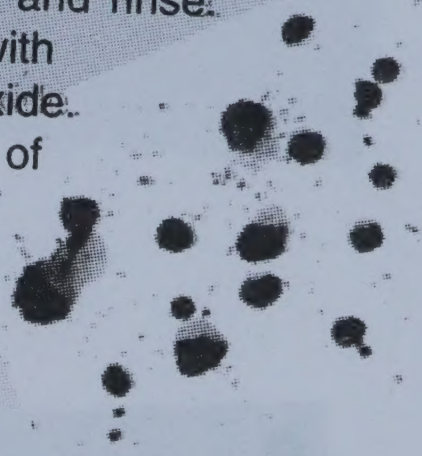
Grease: Apply paste of cornstarch and water. Brush off when dry.

- Or, cover spot with baking soda or cornmeal. Let absorb the grease and brush off.
- Or, scrub spot with toothpaste.
- Or, sponge grease spot on suede with a cloth dipped in white vinegar; dry, brush off.

Blood

Immediately clean stain with club soda or sponge with cold water; "bleach" with 1/4 cup borax in 2 cups water. Sponge with cold water and rinse.

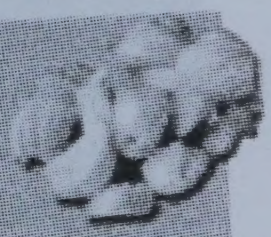
- Or, saturate with hydrogen peroxide. Let sit a couple of min. and wash. May bleach out color, so test first.

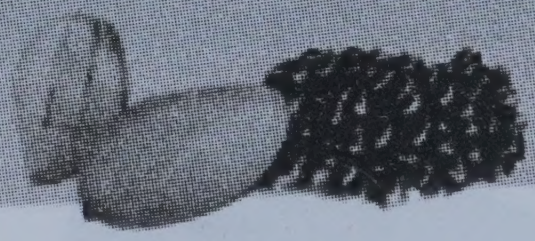


Tougher stains: Make a paste using 3 tbls borax and 1 tbl of lemon juice; scrub with nylon scouring pad and rinse with water.

Fruit stains

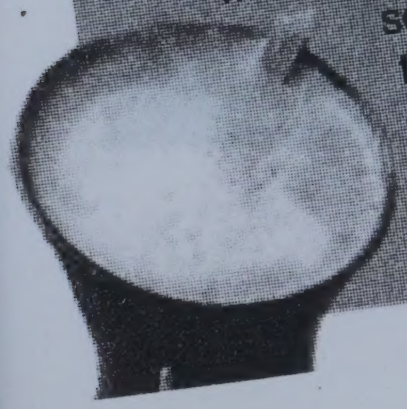
Soak in cold water 30 minutes; rub soap into remaining stain; then wash; "bleach" with lemon juice and sunlight, if needed. Or, soak in vinegar.





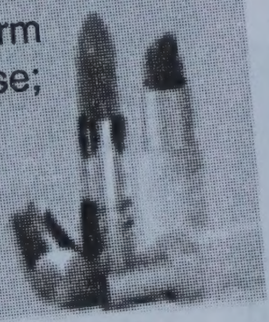
Chocolate and coffee

Soak in cold water, rub with soap and a borax solution, rinse, then launder. If necessary, rub with a borax water paste.



Perspiration: Tough to remove, wash with weak solution of white vinegar or lemon juice and water.

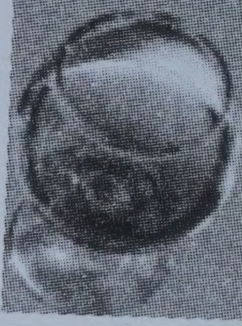
Lipstick: Rub with cold cream to dissolve colour; rinse area with solution of washing soda and warm water to remove grease; wash in soapy water.



Rust stains from clothing: Moisten spot with lemon juice, sprinkle with salt, and leave in the sun for a couple of days.

Tea: Stretch fabric over a basin and pour boiling water over the stain; wash as usual.

Wine: Blot with paper towels to absorb wine. Then apply either club soda, rubbing alcohol, borax or white wine to blot out the stain.



Oil: Rub white chalk into stain before laundering.
- Or, scrub spot with toothpaste.

Ink: Tough stain. Try saturating stain with milk.
- Or, sponge stain with alcohol.
- Or, apply cream of tartar and lemon juice paste. Set for 1 hr.

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